# The Effects of Wage Rise and Monetary Easing on Employment and Prices

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ABSTRACT. In this paper, we investigate the effects of the decline in wages, and examine the effectiveness of wage rise and monetary easing in a simple open economy macroeconomic model. There are three important ingredients in our model. They are the zero interest rate policy, the expectations of deflation (or inflation), and the real debt effect. We found that both of wage rise and monetary easing can increase the level of employment and prices under certain circumstances.

*Keywords*: deflation, real debt effect, zero interest rate policy, wage, monetary easing, exchange rate, imported intermediate input

JEL Classification: E31, E52, F41

# 1. Introduction

In January 2013, the Japanese Government and the Bank of Japan (BOJ) released the "Joint Statement of the Government and the Bank of Japan on Overcoming Deflation and Achieving Sustainable Economic Growth," and in April 2013, BOJ decided to introduce the "Quantitative and Qualitative Monetary Easing." Furthermore, in October 2014, BOJ decided upon the "Expansion of the Quantitative and Qualitative Monetary Easing." These facts mean that deflation had a harmful influence on Japanese economy.

Figure 1 shows the rates of changes of both wages (Total cash earnings) and prices (GDP deflator and Consumer price index) for about the past thirty years. It is readily seen that both of wages and prices began to decline in 1998.<sup>1</sup> Figure 2 shows the labor market conditions. It is evident that the unemployment rate increased and the ratio of active job openings-to-applicants declined in 1998. To overcome such a deflationary depression, BOJ adopted the zero interest rate policy in February 1999. In August 2000, the zero interest rate policy was lifted, but in March 2001

First draft received: the 26th April, 2015. The final accepted: the 11th May, 2015.

<sup>&</sup>lt;sup>1</sup>Yoshikawa(2013) pointed out that the decline in nominal wage was the symptom of the true deflation.

BOJ released the "New Procedures for Money Market Operations and Monetary Easing." Since then, the zero interest rate policy can be said to continue in almost all periods (Figure 3). However, 'Overcoming Deflation' had not been realized at least until the "Quantitative and Qualitative Monetary Easing" was adopted.



-Total cash earnings - -GDP deflator ·····Consumer price index Sources: Ministry of Health, Labour and Welfare, Monthly Labour Survey,

Cabinet Office, Annual Report on National Accounts,

Ministry of Internal Affairs and Communications, Consumer Price Index, (NEEDS CD-ROM).

FIGURE 1. Rates of changes of wages and prices



Sources: Ministry of Internal Affairs and Communications, *Labour Force Survey*, Ministry of Health, Labour and Welfare, *Employment Referrals for General Workers*, (NEEDS CD-ROM).





Source: Bank of Japan, *Financial and Economic Statistics Monthly*, (NEEDS CD-ROM). FIGURE 3. Uncollateralized overnight call rate

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In this paper, we investigate the effects of the decline in wages, and examine the effectiveness of wage rise and monetary easing in a simple open economy macroeconomic model. There are three important ingredients in our model. They are the zero interest rate policy, the expectations of deflation (or inflation), and the Fisher effect of the debt-deflation theory (Fisher, 1933). In this paper, we call the Fisher effect 'the real debt effect.'<sup>2</sup>

In developing our model, Eggertsson(2010) and Eggertsson and Krugman(2012) are useful. Both of these articles deal with the paradox or a fallacy of composition that "if everyone tries to work more, this will in fact reduce aggregate employment in equilibrium." (Eggertsson, 2010, p.1). Both of them assume that the zero interest rate policy is conducted. While the expectations of deflation play an important role in Eggertsson(2010), the real debt effect is the crucial ingredient in Eggertsson and Krugman(2012). Asada(2000) already presented the model similar to that of Eggertsson and Krugman(2012).

This paper is organized as follows. In Section 2, we present a simple open economy macroeconomic model that introduces the imported intermediate input explicitly. In Section 3, we show that the decline in wages can decrease both of the level of employment and prices under certain circumstances. In Section 4, it is shown that both of wage rise and monetary easing can increase the level of employment and prices. Section 5 summarises our discussion and presents some conclusions.

## 2. The Model

We assume a small open economy where the exchange rate is perfectly flexible and the intermediate input needed to produce domestic output is imported. The small country assumption means that variables of the foreign country are given.

**2.1. The goods market.** The gross output (the supply of domestic final product) is described by

(2.1) 
$$y^S = y + \frac{EP^R R^M}{P},$$

where  $y^{S}$  denotes the gross output, y the real income, P the price of domestic output, E the exchange rate defined as the domestic currency price of foreign exchange,  $P^{R}$  the price of the imported intermediate input in terms of the foreign currency,

 $<sup>^2</sup>$  In doing so, we intend to avoid confusing the real debt effect with the Fisher equation that represents the relation between the nominal interest rate, the real interest rate and the expected rate of change of prices.

and  $R^M$  the quantity of intermediate input used up in production (there is no domestic production of intermediate input). In our model that introduces the imported intermediate input explicitly, the real income is distinguished from gross output.<sup>3</sup> We assume that there is a fixed relation between the quantity of intermediate input and the real income:

$$R^M = jy,$$

where j denotes the quantity of intermediate input needed to produce a unit of domestic output, and is assumed to be constant for simplicity.

The demand for domestic output is given by

(2.3) 
$$y^{D} = A\left(y, r, \frac{\bar{D}}{P}; g\right) + X\left(\frac{EP^{F}}{P}; y^{F}\right) - \frac{EP^{F}}{P}M\left(y, \frac{EP^{F}}{P}, \frac{\bar{D}}{P}\right),$$

with  $0 < A_y = \frac{\partial A}{\partial y} < 1$ ,  $A_r = \frac{\partial A}{\partial r} < 0$ ,  $A_d = \frac{\partial A}{\partial (\bar{D}/P)} < 0$ ,  $A_g = \frac{\partial A}{\partial g} = 1$ ,  $\frac{\partial X}{\partial (EP^F/P)} > 0$ ,  $\frac{\partial X}{\partial y^F} > 0$ ,  $\frac{\partial M}{\partial y} > 0$ ,  $\frac{\partial M}{\partial (EP^F/P)} < 0$  and  $\frac{\partial M}{\partial (\bar{D}/P)} < 0$ , where  $y^D$  denotes the demand for domestic output, A the absorption, r the real interest rate,  $\bar{D}$  the nominal private debt of the economy, g the government expenditure, X the exports,  $y^F$  the real income of the foreign country, M the imports of final goods of the foreign country, and  $P^F$  the price of final goods of the foreign country in terms of the foreign currency.

The aggregate demand function is a popular one except that the absorption and the imports are functions of the real debt  $\frac{\bar{D}}{P}$ . The absorption is the sum of consumption, investment and government expenditure. The absorption is an increasing function of real income, because the consumption depends positively on the real income. Hence,  $A_y$  represents the marginal propensity to consume. The absorption depends negatively on the real interest rate, because the investment is a decreasing function of the real interest rate. The exports are dependent both on the real exchange rate  $\frac{EP^F}{P}$  and on the income of the foreign country (assumed to be constant). The imports of final goods of the foreign country depend positively on the real income and negatively on the real exchange rate.

The real debt affects both of the absorption and imports. Hereafter we assume that the nominal private debt  $\overline{D}$  is constant for simplicity. When prices fall, the real debt increases and people decrease the expenditure in the economy as a whole. The reason is as follows. The increase in the real debt will decrease the expenditure

<sup>&</sup>lt;sup>3</sup> See Findlay and Rodriguez(1977), and Ueda(1983; Chapter 5).

of debtors on the one hand, but increase the expenditure of creditors on the other. But, it is reasonable to consider that debtors have higher spending propensities than creditors do (Tobin, 1980; 1993). As a result, the increase in the real debt decreases the absorption and imports, so that the aggregate demand for domestic output decreases. In contrast, the decrease in the real debt increases the demand for domestic output. We call these effects 'the real debt effect.'

Now, we write the trade balance of final goods as

(2.4) 
$$\tilde{T} = X - \frac{EP^F}{P}M$$

and the demand for domestic output (2.3) can be rewritten as follows.

(2.5) 
$$y^{D} = A\left(y, r, \frac{\bar{D}}{P}; g\right) + \tilde{T}\left(y, \frac{EP^{F}}{P}, \frac{\bar{D}}{P}; y^{F}\right),$$

with  $\tilde{T}_y = \frac{\partial \tilde{T}}{\partial y} < 0$ ,  $\tilde{T}_e = \frac{\partial \tilde{T}}{\partial (EP^F/P)} > 0$ ,  $\tilde{T}_d = \frac{\partial \tilde{T}}{\partial (\bar{D}/P)} > 0$ ,  $\tilde{T}_{yF} = \frac{\partial \tilde{T}}{\partial y^F} > 0$ ,  $0 < A_y + \tilde{T}_y < 1$  and  $A_d + \tilde{T}_d < 0$ .

 $\tilde{T}_e > 0$  means that the Marshall-Lerner condition is satisfied.  $A_y + \tilde{T}_y$  represents the marginal propensity to consume minus the marginal propensity to import, and  $A_d + \tilde{T}_d$  represents the real debt effect.

The equilibrium condition in the goods market is given by

$$(2.6) y^S = y^D$$

By substituting (2.1), (2.2) and (2.5) into (2.6), we can rewrite the equilibrium condition in the goods market as follows.

(2.7) 
$$y = A\left(y, r, \frac{\bar{D}}{P}; g\right) + \tilde{T}\left(y, \frac{EP^F}{P}, \frac{\bar{D}}{P}; y^F\right) - \frac{EP^R jy}{P}.$$

As to the price of domestic output P, we assume that firms set the price as follows

(2.8) 
$$P = (1+\pi) \frac{WN + EP^R R^M}{y},$$

where  $\pi$  denotes the mark-up, W the money wage rate, and N the level of employment. That is, the price of domestic output is determined by the unit labor cost, the cost of intermediate input and the mark-up. In this paper, the mark-up is assumed to be constant for simplicity. The money wage rate depends positively on the real income:

(2.9) 
$$W = W(y;\omega),$$

with  $W_y = \frac{\partial W}{\partial y} > 0$  and  $W_\omega = \frac{\partial W}{\partial \omega} > 0$ , where  $\omega$  denotes the exogenous variable affecting the money wage rate. When the real income increases, the demand for labor increases and the money wage rate increases. In contrast, when the real income decreases, the demand for labor decreases and the money wage rate decreases. By substituting (2.2) and (2.9) into (2.8), we have

(2.10) 
$$P = (1 + \pi) \{ W(y; \omega) q + EP^R j \},$$

where the reciprocal of the labor productivity,  $q = \frac{N}{y} = \text{const.}$ , is assumed to be constant for simplicity's sake.

**2.2. Monetary policy, the interest rate and the exchange rate.** We assume that monetary policy is conducted by the interest rate control. Monetary policy of the interest rate control means that the central bank sets the target level on the nominal interest rate. When the interest rate control is conducted, the central bank will supply the quantity of money demanded passively.<sup>4</sup> As a result, the nominal interest rate is always equal to the target level of interest rate set by the central bank. Hence, we have

where i denotes the realized nominal interest rate, and  $i^{T}$  the target level of the nominal interest rate.

The objective of monetary policy is to maintain the price stability, and this is represented as follows.

with  $i_P^T = \frac{di^T}{dP} \ge 0$ . When prices increase (resp. decrease), the central bank will increase (resp. decrease) the target level of the nominal interest rate.

The real interest rate r is given by

$$(2.13) r = i - \hat{p^e},$$

where  $\hat{p^e}$  denotes the expected rate of change of prices. It is represented by

$$\hat{p^e} = \frac{P^e - P}{P},$$

<sup>&</sup>lt;sup>4</sup> See Matsumoto(2007). Monetary policy of the interest rate control is assumed in the New Consensus Macroeconomics. See Meyer(2001).

where  $P^e$  denotes the expected price level, and we assume that  $P^e$  depends positively on prices:

(2.15) 
$$P^e = P^e(P;x),$$

with  $\frac{\partial P^e}{\partial P} > 0$  and  $\frac{\partial P^e}{\partial x} > 0$ , where x denotes the exogenous variable affecting the expected price level. By substituting (2.11), (2.12), (2.14) and (2.15) into (2.13), the real interest rate is rewritten as

(2.16) 
$$r = i^{T}(P) - \frac{P^{e}(P; x) - P}{P}$$

The exchange rate is determined by the uncovered interest rate parity condition

(2.17) 
$$i = i^F + \frac{E^e - E}{E},$$

where  $i^{F}$  denotes the foreign interest rate and  $E^{e}$  the expected exchange rate. The foreign interest rate is assumed to be given under the small country assumption.

Now, we assume that people anticipate the purchasing power parity(PPP) holds in the long run. PPP is represented by

$$(2.18) P = EP^F.$$

Hence, the assumption about PPP means

$$P^e = E^e P^F,$$

where the price of final goods of foreign coutry  $P^{F}$  is assumed to be given under the small country assumption. From (2.19), the expected exchange rate is given by

(2.20) 
$$E^e = E^e \left( P^e; P^F \right)$$

with  $\frac{\partial E^e}{\partial P^e} = \frac{1}{P^F} > 0$  and  $\frac{\partial E^e}{\partial P^F} = -\frac{E^e}{P^F} < 0$ .

By substituting (2.11), (2.12), (2.15) and (2.20) into (2.17), we can rewrite the uncovered interest rate parity condition as

(2.21) 
$$i^{T}(P) = i^{F} + \frac{E^{e}(P^{e}(P;x);P^{F}) - E}{E}$$

Assuming that the uncovered interest rate parity holds at all times, the exchange rate is given by

(2.22) 
$$E = E\left(P; i^F, P^F, x\right),$$

with  $\frac{\partial E}{\partial P} = \frac{E^2}{E^e} \left( \frac{\partial P^e}{\partial P} \frac{1}{EP^F} - i_P^T \right) \ge 0, \ \frac{\partial E}{\partial i^F} = \frac{E^2}{E^e} > 0, \ \frac{\partial E}{\partial P^F} = -\frac{E}{P^F} < 0 \text{ and}$  $\frac{\partial E}{\partial x} = \frac{E}{P^e} \frac{\partial P^e}{\partial x} > 0.$ 

**2.3. AD-AS model of the open economy.** Our model consists of the Aggregate Demand and the Aggregate Supply. By substituting (2.16) and (2.22) into (2.7), the equilibrium condition in the goods market is rewritten as

(2.23) 
$$y = A\left(y, r\left(\cdot\right), \frac{\bar{D}}{P}; g\right) + \tilde{T}\left(y, \frac{E\left(\cdot\right)P^{F}}{P}, \frac{\bar{D}}{P}; y^{F}\right) - \frac{E\left(\cdot\right)P^{R}jy}{P}$$

The equation (2.23) represents the Aggregae Demand AD schedule including the imported intermediate input explicitly.

By substituting (2.22) and (2.10), we obtain the price of domestic output as follows.

(2.24) 
$$P = (1 + \pi) \left\{ W(y; \omega) q + E(P; i^F, P^F, x) P^R j \right\}.$$

The equation (2.24) represents the Aggregate Supply AS schedule including the imported intermediate input explicitly.

Our model consists of (2.23) and (2.24). The dynamics can be described by the following pair of differential equations in y and P. (2.25)

$$\dot{y} = \alpha \left[ A \left( y, r\left( \cdot \right), \frac{\bar{D}}{P}; g \right) + \tilde{T} \left( y, \frac{E\left( \cdot \right) P^{F}}{P}, \frac{\bar{D}}{P}; y^{F} \right) - \frac{E\left( \cdot \right) P^{R} j y}{P} - y \right],$$

$$(2.26) \qquad \dot{P} = \beta \left[ (1 + \pi) \left\{ W\left( y; \omega \right) q + E\left( P; i^{F}, P^{F}, x \right) P^{R} j \right\} - P \right].$$

An overdot on a variable designates the time derivative, and  $\alpha$  and  $\beta$  are positive coefficients. Linearising the pair of (2.25) and (2.26) around equilibrium, we have

(2.27) 
$$\begin{bmatrix} \frac{d}{dt}(y-y^*)\\ \frac{d}{dt}(P-P^*) \end{bmatrix} = \begin{bmatrix} \alpha b_{11} & \alpha b_{12}\\ \beta b_{21} & \beta b_{22} \end{bmatrix} \begin{bmatrix} y-y^*\\ P-P^* \end{bmatrix}.$$

$$(2.28) \quad b_{11} = A_y + \tilde{T}_y - 1 - \frac{EP^R j}{P} < 0,$$

$$(2.29) \quad b_{12} = i_P^T \left\{ A_r - \left( \tilde{T}_e P^F - P^R j y \right) \frac{E^2}{PE^e} \right\} - \frac{a \left\{ A_r P^e - \left( \tilde{T}_e P^F - P^R j y \right) E \right\} + \left( A_d + \tilde{T}_d \right) \bar{D}}{P^2},$$

$$(2.20) \quad b_r = (1 + \pi) W \quad a \ge 0$$

(2.30) 
$$b_{21} = (1+\pi)W_y q > 0,$$
  
(2.31)  $b_{22} = -i_P^T (1+\pi) \frac{E^2 P^R j}{E^e} + (1+\pi)(1+a) \frac{EP^R j}{P} - 1,$ 

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with  $a = \frac{\partial P^e}{\partial P} \frac{P}{P^e} - 1$ , where  $y^*$  and  $P^*$  denote the equilibrium levels of real income and prices, respectively.

The characteristic equation is given by

$$\lambda^2 + h_1 \lambda + h_2 = 0$$

where

(2.33) 
$$h_1 = -(\alpha b_{11} + \beta b_{22}),$$

(2.34) 
$$h_2 = \alpha \beta (b_{11}b_{22} - b_{12}b_{21}).$$

Stability requires that the coefficient of  $\lambda$  and the determinant be positive,

 $h_1 > 0, \quad h_2 > 0.$ 

These conditions may or may not hold, however.

Hence, we make two assumptions as follows.

- (i) The zero interest rate policy is conducted.
- (ii) The elasticity of the expectations of prices is greater than unity.

The important point for the zero interest rate policy is that even if prices should increase, the central bank must keep the target level of the interest rate at zero. Hence, the assumption (i) means

(2.35) 
$$i_P^T = 0.$$

By the assumption (ii), we have

(2.36) 
$$a = \frac{\partial P^e}{\partial P} \frac{P}{P^e} - 1 > 0.$$

Furthermore, we assume

hereafter.<sup>5</sup> Considering all the assumptions, we obtain

$$b_{11} < 0, \quad b_{12} > 0, \quad b_{21} > 0, \quad b_{22} \ge 0.$$

To investigate the stability, we use AD and AS schedules. The slopes of AD and AS schedules are given as follows.

(2.38) 
$$\frac{dP}{dy}\Big|_{AD} = -\frac{b_{11}}{b_{12}} > 0,$$

<sup>&</sup>lt;sup>5</sup> In the usual open economy macroeconomic model that does not consider the imported intermediate input explicitly, this assumption holds, because  $P^R jy$  on the lefthand side of the equation is ignored.

(2.39) 
$$\frac{dP}{dy}\Big|_{AS} = -\frac{b_{21}}{b_{22}} \ge 0.$$

The AD schedule is upward-sloping, but the slope of the AS schedule is not determined. By assuming

$$b_{22} < 0$$
,

we have the typical upward-sloping AS schedule, and one of the stability conditions

$$h_1 > 0$$

is satisfied. The relation between the slope of AD schedule and that of AS schedule is given by

(2.40) 
$$\frac{dP}{dy}\Big|_{AS} - \frac{dP}{dy}\Big|_{AD} = \frac{b_{11}b_{22} - b_{12}b_{21}}{b_{12}b_{22}}.$$

One of the stability conditions is that  $h_2$  is positive, that is

$$b_{11}b_{22} - b_{12}b_{21} > 0.$$

If this condition is satisfied, we have

(2.41) 
$$0 < \frac{dP}{dy}\Big|_{AS} < \frac{dP}{dy}\Big|_{AD}.$$

In other words, if the system is stable, AD schedule must be steeper than AS schedule as depicted in Figure 4. We assume that these conditions are satisfied.



FIGURE 4. AD-AS model

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#### 3. The Decline in Wages and Deflation

We come to comparative statics. First, we look at the effects of the decline in wages. Defferentiating the system totally will yield

(3.1) 
$$\begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} dy \\ dP \end{bmatrix} = \begin{bmatrix} 0 \\ -(1+\pi) W_{\omega}q, \end{bmatrix} d\omega,$$

and taking  $d\omega$  as an autonomous change in wages, we obtain

(3.2) 
$$\frac{dy}{d\omega} = \frac{(1+\pi)W_{\omega}qb_{12}}{\Delta} > 0,$$

(3.3) 
$$\frac{dP}{d\omega} = -\frac{(1+\pi)W_{\omega}qb_{11}}{\Delta} > 0,$$

where

$$\Delta = b_{11}b_{22} - b_{12}b_{21} > 0.$$

As shown in Figure 5, the decline in wages shifts the AS schedule downward, so that the level of real income decreases and the price level falls.



FIGURE 5. The effects of the decline in wages

The decline in wages decreases the price level directly. Under the zero interest rate policy, the fall of the price level increases the real interest rate, decreases the nominal exchange rate (an appreciation of domestic currency), and decreases the real exchange rate (a real appreciation of domestic currency). These results are

shown as follows.

(3.4) 
$$\frac{dr}{dP} = -\frac{aP^e}{P^2} < 0,$$

(3.5) 
$$\frac{dL}{dP} = \frac{(1+a)L}{P} > 0,$$

(3.6) 
$$\frac{d\left(\frac{EP^{F}}{P}\right)}{dP} = \frac{aEP^{F}}{P^{2}} > 0.$$

The real interest rate increases, because the fall of the price level brings about the expectations of deflation through the fall of the expected price level. The nominal exchange rate decreases, because the fall of the price level lowers the expected exchange rate through the fall of the expected price level. Both of the increase of real interest rate and the decrease of real exchange rate decrease the aggregate demand. The fall of the nominal exchange rate lowers the price level through the decrease in domestic currency price of the imported intermediate input. The fall of the price level increases the real debt so that the aggregate demand decreases. The decrease in the aggregate demand lowers the real income and the level of employment, and the wages decline further.

We conclude that the decline in wages from 1998 brought about deflation in Japan.

#### 4. The Effects of Wage Rise and Monetary Easing

In this section, we examine the effects of wage rise and monetary easing.

First, taking  $d\omega$  as a wage rise in (3.2) and (3.3) of the preceding section, we can examine the effects of wage rise on the level of employment and the price level. As in the preceding section, we assume that (i) the zero interest rate policy is conducted, and (ii) the elasticity of the expectations of prices is greater than unity.

The increase in wages shifts *AS* schedule upward as depicted in Figure 6. The wage rise increases the price level directly. The increase in the price level lowers the real interest rate (3.4), because the increase in the price level brings about the expectations of inflation through the increase in the expected price level on the one hand, but the central bank does not change the target level of the nominal interest rate on the other. The increase in the price level also increase the expected exchange rate through the increase in the expected price level. As a result, both of the nominal exchange rate (3.5) and the real exchange rate (3.6) increase. Both of the decline in the real interest rate and the increase in the real exchange rate increase the aggregate demand. The increase in the nominal exchange rate increases the price level through the increase in the domestic currency price of the imported intermediate input. The

increase in the price level that is brought about by both of the wage rise and the increase in the nominal exchange rate decreases the real debt, so that the aggregate demand increases. The increase in the aggregate demand will increase the real income and the level of employment. Therefore, *the wage rise will be effective in overcoming deflation*.



Next, we examine the effects of monetary easing. As we assume that the zero interest rate policy is conducted, we interpret the monetary easing as the policy of increasing the expected price level. Hence, the monetary easing is described by an increase in x. Differentiating the system totally will give us

(4.1) 
$$\begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} dy \\ dP \end{bmatrix} = \begin{bmatrix} k_1 \\ k_2 \end{bmatrix} dx,$$

and taking dx > 0 as the monetary easing, we obtain

(4.2) 
$$\frac{dy}{dx} = \frac{k_1 b_{22} - k_2 b_{12}}{\Delta} > 0,$$

(4.3) 
$$\frac{dP}{dx} = \frac{k_2 b_{11} - k_1 b_{21}}{\Delta} > 0,$$

where

(4.4) 
$$k_1 = \left\{ A_r P^e - \left( \tilde{T}_e P^F - P^R j y \right) E \right\} \frac{\partial P^e}{\partial x} \frac{1}{P P^e} < 0,$$

(4.5) 
$$k_2 = -(1+\pi) \frac{EP^R j}{P^e} \frac{\partial P^e}{\partial x} < 0.$$

The conduct of monetary easing shifts AD schedule to the right and AS schedule upward as depicted in Figure 7. As a result, both of the real income and the price level increase.



If the conduct of monetary easing could increase the expected price level successfully, the expectations of inflation are brought about and the real interest rate declines. The increase in the expected price level increases the nominal exchange rate through the increase in the expected exchange rate. Considering the time lag on the price level, the increase in nominal exchange rate increases the real exchange rate. The increase in the nominal exchange rate increases the domestic currency price of the imported intermediate input and the price level proportionately under the zero interest rate policy. As a result, the real debt decreases. The decline in the real interest rate, the increase in the real exchange rate and the decrease in the real debt will increase the real income and the level of employment through the increase in the aggregate demand, so that wages increase further. The increase in wages will increase the price level, so that the expected price level increases further. Therefore, *the monetary easing will be effective in overcoming deflation*.

## 5. Concluding Remarks

In this paper, we examined the effects of the change of wages and the monetary easing on the level of employment and prices. Our findings are as follows. Provided that the zero interest rate policy is conducted, assuming (1) there is the real debt effect and/or (2) the elasticity of the expectations of prices is greater than unity, the

decline in wages decreases the level of employment and prices. We can consider that the cause of deflation in Japan was the decline in wages from 1998. If the same conditions hold, both of wage rise and monetary easing can increase the level of employment and the price level. That is, to overcome deflation, wage rise is needed and it is necessary to continue to conduct "Quantitative and Qualitative Monetary Easing."

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Acknowledgments. An earlier version of this paper was presented at the 2014 Autumn Meeting of Japan Association for Applied Economics(Chuo University). I am grateful to Toichiro Asada and other participants at the Meeting for helpful comments and suggestions. I would also like to thank an anonymous referee of this journal for useful comments. Needless to say, I am solely responsible for any remaining errors.

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